

Incident Investigation Findings Summary



Incident Date(s): November 29, 2021
Incident Title: Plant 2 Reformer Flange Leak and Fire
Executive Summary <p>While performing normal pump switching activities in the Plant 2 Reformer, an operator was shutting down a steam driven pump to bring an electrically driven pump online. During the switch, the electric pump did not start up which caused a compressor and the heaters to trip. While bringing the equipment back online, a small fire was seen at a reactor flange. Operators activated the plant alarm and used fire hydrants and monitors to extinguish the fire. Once extinguished, operators continued with the safe shutdown of the unit. No injuries were reported in connection with this incident and the "All Clear" alarm was activated about 30 minutes after the initial fire alarm was sounded.</p>
Incident Summary <p>As part of normal operations activities, Suncor operators were switching from one pump (steam driven) to another pump (electrically driven) in the process unit. When the steam was being closed to the steam driven pump, the electric pump did not start as anticipated, which then caused the recycle compressor to trip. When the recycle compressor trips, this also causes the heaters for the unit to trip. Suncor operators were able to get the recycle compressor restarted within 2 minutes but were not able to get the heaters started as quickly. As the heaters tripped, the temperature in the reactors began to drop. Over the next 15 minutes, operators were able to bring the heaters back online.</p> <p>As the operators began bringing the rest of the unit back to normal operations, gray smoke was seen at one of the inlet flanges to a reactor in the unit which resulted in the operators shutting the heaters down manually. Operators in the area also noted flames near the flange and sounded the plant alarm signaling a fire in the unit. This activated the refinery Emergency Response Team (ERT) and the Emergency Operations Center (EOC). Personnel in the field used fire hydrants and monitors to extinguish the fire. While the fire was being extinguished, operators also began the emergency shutdown process of the unit.</p> <p>From the initial sounding of the plant fire alarm to the unit being safely shutdown and the all-clear being given, the total time was roughly 30 minutes.</p>
Incident Investigation Summary <p>Two investigations were launched following this incident. The first was to investigate the pump switching failure and the subsequent recycle compressor trip. The second was to investigate the flange leak and fire.</p> <p>1 – Pump Switching Failure and Recycle Compressor Trip</p> <p>Operators followed normal process when switching the pumps from the steam-driven pump to the electric-driven pump. During the process, the automatic start of the electric pump is initiated when lubrication oil pressure in the recycle compressor drops. When the steam-driven pump was slowing down, the electric-driven pump did not start. The failure of the electrically driven pump to start was found to be caused by a failed circuit breaker in that pump's system.</p> <p>When the two pumps were not running, the recycle compressor and heaters shutdown as part of the unit's programming. Normally, this program is bypassed during the pump switch process so the heaters and recycle compressor will not trip, but the investigation showed the program had not been bypassed.</p> <p>2 – Flange Leak and Fire</p> <p>When the heaters were shut down, the reactors rapidly cooled. Within 10 minutes of shutdown, the reactor cooled off several hundred degrees from the normal operating temperature. This rapid cooling caused a partial</p>

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relaxation of the clamping force at the flange near the reactor inlet. This relaxation allowed a leak of roughly 90% hydrogen and 10% naphtha and other light hydrocarbons, which auto ignited. The fire was localized to the flange and was quickly extinguished using refinery emergency response equipment. Prior to restarting the unit, the flange was retorqued to ensure proper clamping force to prevent a leak.

Recommended Actions to Prevent Recurrence

To reduce the likelihood of recurrence, the following actions were recommended:

1. Revise "Switching Recycle Compressor Lube Oil Pumps" procedure to include a safe pump swap and test of the pressure switch.
 - a. Revise the training module for the Heater Fuel Gas Shutdown and for a restart after a trip as needed.
 - b. Conduct special refresher training for all B Board certified operators.
2. Replace gasket and studs on reactor flange at next shutdown.